U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Ostodes strigatus

Common Name:

sisi snail

Lead region:

Region 1 (Pacific Region)

Information current as of:

06/01/2013

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

> ___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status
>
> ___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species
>
> ___ Range is no longer a U.S. territory
>
> ___ Insufficient information exists on biological vulnerability and threats to support listing
>
> ___ Taxon mistakenly included in past notice of review
>
> ___ Taxon does not meet the definition of "species"
>
> ___ Taxon believed to be extinct
>
> ___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: American Samoa
- **US Counties**: Manu'a, AS
- **Countries**: United States

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: American Samoa
- **US Counties**: Manu'a, AS
- **Countries**: United States

Land Ownership:

Land ownership in American Samoa generally follows a historic village tradition. Large sections of land around each village are controlled by that village for the use by the village residents. The Maloata population of the sisi snail is within the bounds of Maloata Village.

Lead Region Contact:

ARD-ECOL SVCS, Jesse D'Elia, 5032312349, jesse_delia@fws.gov

Lead Field Office Contact:

PACIFIC ISLANDS FISH AND WILDL OFC, Kristi Young, 503 231-6845, kristi_young@fws.gov

Biological Information

Species Description:

The sisi snail (*Ostodes strigatus*) is in the superfamily Cyclophoroidea and the family Poteriidae (=Neocyclotidae), a family of tropical land snails with a pallium cavity (lung-like organ) and an operculum (Cowie 1998; Vaught 1989; Barker 2001). It has a white depressed conical shell with distinctive parallel ridges and a multispiral operculum (Abbott 1989). The sisi snail is a ground-dwelling snail that feeds on decaying leaf litter and fungus (Girardi 1978). It is likely that adults deposit eggs into leaf litter where they develop and hatch.

Taxonomy:

The sisi snail is a member of the family Poteriidae, which occurs through tropical Central and South America. The genera *Ostodes* and *Gassiesia* are confined to the islands of the South Pacific. All members of the family are ground-dwelling snails (Girardi 1978; Abbott 1989). Girardi (1978) and Cowie (1998) are the most recent and accepted taxonomic work for this species.

Habitat/Life History:

The sisi snail is found on the ground in rocky areas at lower elevations. The vegetation is characterized by a relatively closed canopy with light understory plant coverage. While these areas (below 500 feet (ft) (152 meters (m) elevation) receive moderate to high rainfall, they are drier and more open than the wet forests found at higher elevation or along the northern sections of coastline (Miller 1993).

Historical Range/Distribution:

The sisi has only been known from the island of Tutuila, American Samoa (Miller 1993).

Current Range Distribution:

During a survey of snails in American Samoa (Miller 1993), fewer than 50 live snails were seen; all of these were in Maloata Valley at 121-400 ft (37-122 m) in elevation) on the western end of the island of Tutuila, American Samoa. The snails were found to be highly scattered in the leaf litter on the forest floor under an intact canopy of 32-49 ft (10-15 m) above the ground. Several live predatory, rosy carnivore snails (*Euglandina rosea*) were found in the same area, and the ground was littered with the shells of dead sisi snails. Shells of dead sisi snails were found at four of the eight survey sites in Maloata Valley including the site with live sisi snails.

Population Estimates/Status:

Fewer than 50 live snails were seen in Maloata Valley (Miller 1993).

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or

range:

The declines of the native snails in American Samoa have resulted, in part, from significant loss of native habitat to forestry and agriculture, loss of native forest structure to hurricanes, and the establishment of alien weeds after these storms. These threats may interact to greatly exacerbate the loss of populations and species. All live sisi snails have been found in the leaf litter beneath remaining intact forest canopy. No snails were found in areas bordering agricultural plots or in forest areas that were severely damaged by three hurricanes (1987, 1990, and 1991) (Miller 1993). Under natural historic conditions, loss of forest canopy to storms did not pose a great threat to the long term survival of these snails; enough intact forest with healthy populations of snails would support dispersal back into newly regrown canopy forest. However, the presence of alien weeds such as *Mikania micrantha* (mile-a-minute vine) may reduce the likelihood that native forest will re-establish in areas damaged by the hurricanes (Whistler 1992). This loss of habitat to storms is greatly exacerbated by an expanding agriculture needed to support one of the worlds highest human population growth rates (Craig et al. 1993). Agricultural plots have spread from low elevation up to middle and some high elevations on Tutuila, greatly reducing the forest area and thus reducing the resilience of native forests and their populations of native snails. These reductions also increase the likelihood that future storms will lead to the extinction of populations or species that rely on the remaining canopy forest.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

None known.

C. Disease or predation:

At present, the major existing threat to long-term survival of the native snail fauna in American Samoa is predation by the alien rosy carnivore snail, the most commonly recommended biological control agent of the giant African snail (*Achatina fulica*). Numerous studies show that the rosy carnivore snail feeds on endemic island snails and is a major agent in their declines and extinctions (van der Schalie 1969; Hart 1978; Hadfield and Mountain 1981; Howarth 1983, 1985, 1991; Clarke et al. 1984; Pointier and Blanc 1984; Hadfield 1986; Murray et al. 1988; Hadfield et al. 1989, 1993; Kinzie 1992; Cowie 2001).

In an effort to eradicate the giant African snail, the rosy carnivore snail and another alien predatory snail, *Gonaxis kibweziensis* (no common name), were introduced in 1980 and 1977, respectively (Eldredge 1988). The rosy carnivore snail has spread throughout the main island of Tutuila and has also spread to the island of Tau (Eldredge 1988). *G. kibweziensis* is present only on Tutuila and seems to be in decline (Eldredge 1988). Several live rosy carnivore snails were found in the same type of habitat in which the sisi snail occurs, and the ground was littered with the shells of dead sisi snails (Miller 1993).

The rosy carnivore snail is also a host to the rat lung worm, a parasite (Mead 1961; van der Schalie 1969). It is not known if the parasite can be maintained in populations of native snails or if a parasite load would have negative effects on snail reproduction.

In addition, a likely threat to the sisi snail is the high probability of the spread of the predatory Manokwar flatworm, *Platydemus manokwari*, into occupied snail habitat. The Manokwar flatworm has contributed to the decline of native tree snails due to its ability to ascend into trees and bushes that support native snails. Areas with populations of the flatworm usually lack partulid tree snails or have declining numbers of snails (Hopper and Smith 1992). The predatory flatworm currently occurs on Tutuila; however, it has not been confirmed to occur in areas occupied by the sisi snail (Tulafono 2006, pers. comm.).

D. The inadequacy of existing regulatory mechanisms:

Currently, no formal or informal protection is given to the sisi snail by the Federal or American Samoa

governments or by private individuals or groups.

E. Other natural or manmade factors affecting its continued existence:

Even if the threats responsible for the decline of this species were controlled, the persistence of existing populations is hampered by the small number of extant populations and the small geographic range of known populations. This circumstance makes the species more vulnerable to extinction due to a variety of natural processes. Small populations are particularly vulnerable to reduced reproductive vigor caused by inbreeding depression, and they may suffer a loss of genetic variability over time due to random genetic drift, resulting in decreased evolutionary potential and ability to cope with environmental change (Lande 1988; Pimm et al. 1988; Center for Conservation Biology 1994; Mangel and Tier 1994). Stochastic environmental events, like severe storms, can affect the continued existence of the sisi snail due to the small numbers of populations and individuals that remain.

Conservation Measures Planned or Implemented :

American Samoas Department of Marine and Wildlife Resources are currently in the planning stages of conducting a tree snail assessment project which will include gathering data on the distribution and abundance of tree snails throughout Tutuila, American Samoa. Additionally, a mark recapture study may be implemented to investigate population demographics of target species. Due to time constraints, initially only vegetation will be searched (not forest litter), therefore these surveys will likely not provide additional information on the status of the sisi snail, though information on the distribution and abundance of nonnative predatory snails will be collected (Tulafono, in litt. 2011).

Summary of Threats :

Based on our evaluation of habitat degradation and loss and the effects of predation, we conclude there is sufficient information to develop a proposed rule for this species due to the threat of habitat destruction or modification by agriculture, forestry, and nonnative invasive weeds, and the threat of predation by the rosy carnivore snail. In addition, the spread of the predatory Manokwar flatworm is a likely threat to the sisi snail. Stochastic environmental events, such as severe storms and typhoons, potentially threaten this snail due to its limited distribution and small number of individuals. We find that this species is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

- Conduct extensive surveys for sisi snail
- Develop and implement nonnative snail removal and control program
- Confirm presence of nonnative predatory flatworm in areas occupied by sisi snail and develop and implement nonnative flatworm control program
- Conduct habitat restoration and control and remove nonnative plant species

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	**2**
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

The threats to the sisi snail from habitat destruction and modification by forestry and agricultural use and invasive nonnative plants and by predation from nonnative predatory snails are of high magnitude. These threats occur across its range. The small number of individuals and the small number of populations also make this species very susceptible to the negative effects of randomly occurring natural events such as typhoons and storms. In addition, this species is likely threatened by the Manokwar flatworm.

Imminence :

The primary threats to this species from habitat degradation and loss from forestry and agricultural use and invasive nonnative plants, and predation by nonnative predatory snails are imminent because they are ongoing occur throughout the range of the species.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of the sisi snail as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

Description of Monitoring:

We conducted literature searches for recent articles on this species and contacted relevant species experts, including University of Hawaii researchers regarding the current status of this species. No additional information on the species status was found. However, the existing data regarding the species status was verified.

This level of monitoring is appropriate to update the status of the species because a thorough literature search was conducted and relevant species experts were contacted. Information contained in this assessment form was verified and any updated information incorporated.

The sisi snail is included as a species of concern in American Samoas comprehensive wildlife conservation strategy (Department of Marine and Wildlife Resources, American Samoa Government 2006).

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

none

Indicate which State(s) did not provide any information or comment:

American Samoa

State Coordination:

On February 22, 2013, we sent a letter to the American Samoa Department of Marine and Wildlife Resources requesting their review and comment on our most recent candidate assessment of this species. No additional information or comments were received.

Literature Cited:

Abbott, R.T. 1989. Compendium of Landshells. American Malacologists. Burlington, MA.

Barker, G.M. (ed.) 2001. The biology of terrestrial molluscs. CABI Publishing, New York. 565 pp.

Center for Conservation Biology. 1994. Nectar, fecundity and conservation planning. Center for Conservation Biology Update 8(1):10.

Clarke, B.C., J.J. Murray, and M.S. Johnson. 1984. The extinction of endemic species by a program of biological control. Pacific Science 38:97-104.

Cowie, R.H. 1998. Catalog of the nonmarine snails and slugs of the Samoan Islands. Bishop Museum Bulletin in Zoology 3. Bishop Museum Press, Honolulu. viii plus 122 p.

Cowie, R.H. 2001. Can snails ever be effective and safe biocontrol agents? International Journal of Pest Management 47(1):23-40.

Craig, P., P. Trail, G. Grant, J. Craig, and D. Itano. 1993. American Samoa: Natural History and Conservation Topics. Volume 1. Biological Report Series, Report Number 42. Department of Marine and Wildlife Resouces, American Samoa Government.

Department of Marine and Wildlife Resources, American Samoa Government. 2006. A comprehensive strategy for wildlife in American Samoa September 2005, revised November 2006. 116 pp.

Eldredge, L.G. 1988. Case studies of the impacts of introduced animal species on renewable resources in the

U.S.-affiliated Pacific islands. Pp. 118-146. In Smith, B.D. (ed.), Topic reviews in insular resource development and management in the Pacific U.S.- affiliated islands. Univ. Guam Marine Lab. Tech. Rep. 88.

Girardi, E.L. 1978. The Samoan land snail genus *Ostodes* (Mollusca: Prosobranchia: Poteriidae). Veliger 20:191-250.

Hadfield, M.G. 1986. Extinction in Hawaiian achatinelline snails. Malacologia 27:67-81.

Hadfield, M.G., S.E. Miller and A.H. Carwile. 1989. Recovery plan for the O'ahu tree snails of the genus *Achatinella*. U.S. Fish and Wildlife Service, 300 Ala Moana Blvd., Honolulu, Hawaii 96850.

Hadfield, M.G., S.E. Miller and A.H. Carwile. 1993. Decimation of endemic Hawai'ian tree snails by alien predators. Am. Zool. 33(6):610-622.

Hadfield, M.G., and B.S. Mountain. 1981. A field study of a vanishing species, *Achatinella mustelina* (Gastropoda, Pulmonata) in the Wai'anae Mountains of O'ahu. Pacific Sci. 34:345-358.

Hart, A.D. 1978. The onslaught against Hawaii's tree snails. Natural History. Pp. 46-57.

Hopper, D.R., and B.D. Smith. 1992. The status of tree snails (Gastropoda: Partulidae) on Guam, with a resurvey of sites studied by H.E. Crampton in 1920. Pacific Sci. 46:77-85.

Howarth, F.G. 1983. Classical biocontrol: Panacea or Pandora's box? Proc. Hawaiian entomol. Soc. 24:239-244.

Howarth, F.G. 1985. Impacts of alien land arthropods and mollusks on native plants and animals in Hawaii. in: Stone, C.P., and J.M. Scott (eds.), Hawaii's terrestrial ecosystems: preservation and management. Cooperative National Park Research Studies Unit, Honolulu, Hawaii. Pp. 149-179.

Howarth, F.G. 1991. Environmental impacts of classical biological control. Ann. Rev. Entomol. 36:485-509.

Kinzie, R.A. 1992. Predation by the introduced carnivorous snail *Euglandina rosea* (Ferussac) on endemic aquatic lymnaeid snails in Hawaii. Biological Conservation 60:149-155.

Lande, R. 1988. Demographic models of the northern spotted owl (*Strix occidentalis caurina*). Oecologia 75: 601-607.

Mangel, M., and C. Tier. 1994. Four facts every conservation biologist should know about persistence. Ecology 75:607-614.

Mead, A.R. 1961. The giant African snail: a problem in economic malacology. University of Chicago Press. 257 pp.

Miller, S.E. 1993. Final report on surveys of the arboreal and terrestrial snail fauna of American Samoa. Unpublished report to the U.S. Fish and Wildlife Service, Pacific Islands Office, Honolulu, Hawaii. 30 pp.

Murray, J.J., E. Murray, M.S. Johnson, and B.C. Clarke. 1988. The extinction of Partula on Moorea. Pacific Science 42:150-153.

Pimm, S., H.L. Jones, and J. Diamond. 1988. On the risk of extinction. American Naturalist 132:757-785.

Pointier, J.D., and C. Blanc. 1984. *Achatina fulica* en Polynesie Francaise. Situation en 1982-83 en Polynesie Francaise apres l'introduction des escargots geants en 1967. Centre de l'Environment, Moorea, Rapport

RA13. 42 pp.

van der Schalie, H. 1969. Man meddles with nature - Hawaiian style. The Biologist 51:136-146.

Vaught, K.C. 1989. A Classification of the Living Mollusca. American Malacologists, Inc. Melbourne, Florida, U.S.A.

Whistler, W.A. 1992. Vegetation of Samoa and Tonga. Pacific Science 46:159-178.

Personal Communications and In Litteris

Tulafono, U.R. Director, American Samoa Department of Marine and Wildlife Resources. Faxed letter regarding the Departments response to candidate assessment forms, September 5, 2006.

Tulafono, U.R. Director, American Samoa Department of Marine and Wildlife Resources. Emailed letter dated March 31, 2011, regarding the Departments response to candidate assessment forms. Received April 4, 2011.

Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  06/13/2013
Date

Concur:  10/28/2013
Date

Did not concur: _____
Date

Director's Remarks: